

REMARKS

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

The specification has been carefully reviewed, and editorial changes have been effected.

All of the changes are minor in nature and therefore do not require extensive discussion. In particular, the specification headings have been amended in accordance with U.S. practice.

Claims 2-4 and 8-13 have been cancelled without prejudice, and claims 1, 5, 6 and 7 have been amended. Specifically, the claim amendments have been effected to more particularly define the present invention and to put the claims in better form under U.S. practice.

Before addressing each of the prior art rejections, Applicants wish to review characteristics of the present invention which are relevant to the arguments below.

When a polarized lens is manufactured by casting the polyurethane resin composition as specified in claim 1, a polarized film (1) (see the attached drawing enclosed herewith) is sandwiched in a frame formed of a soft plastic, generally called a gasket (10), between mold members (11,12) set on both sides thereof. The above composition (monomer) is poured on both sides of the polarized film (1) (30-40 microns), which is curved.

This monomer is fed in a liquid form, moves into the air gap (16), and is polymerized filling in the air gap, thereby forming transparent plastic substrate layers 2 and 3 which sandwich the polarized film. The basic form of the polarized lens is thus formed. When the basic form of the polarized lens is removed from the gasket (10), the polarized lens is completed.

During such casting, it is necessary that the polyurethane resin composition be low in viscosity so that it fills the air gap without a gap. Also, the pot life of the polyurethane resin composition should be long so that it is possible to take a sufficiently long time for casting.

Since the claimed polyurethane resin composition of the present application possess these characteristics (*low in viscosity, long pot life*), it is an optimum resin composition for manufacturing polarized lenses by casting.

With regard to the rejection of claims 1, 2, 4-9 and 12-13 under 35 USC § 102(a) as being anticipated by Slagel, this rejection has been overcome by the amendments to the claims and the following remarks.

To constitute anticipation of the claimed invention under U.S. practice, a single prior art reference must disclose each and every material element of the claim. Here, in this case, since non-rejected claim 3 has now been incorporated into claim 1, this rejection can no longer be sustained and should be withdrawn.

Also, it should be noted that since Slagel does not teach using 4,4'-methylene-bis(2-chloroaniline) as a polyamine used as a curing agent, the pot life of the polyurethane in Slagel is short.

In addition, although claim 20 of the Slagel reference recites a polyurethane resin for use as a material for lenses, it merely teaches a uniform lens that can be formed even if the pot life is short. Slagel fails to disclose that its polyurethane resin can be used for polarized lenses which Applicants have demonstrated in the specification and in the argument above, optimumly requires a long pot life.

Thus, in view of the amendments to claim 1 and the above arguments, this rejection can no longer be sustained and should be withdrawn.

With regard to the rejection of claims 1-4 and 7 under 35 USC § 102(b) as being anticipated by Carr, this rejection is deemed to be untenable and is thus respectfully traversed.

Applicants believe that the Examiner has not correctly understood the teachings of Carr. Although Carr uses 4,4'-methylene-bis (cyclohexyl isocyanate), it does not teach the average molecular weight of the polyhydroxy compound and the NCO content of the polyurethane prepolymer as claimed in newly amended claim 1. Thus, Applicants believe that the polyurethanes in Carr will result in the cross-linking density of the lens being lower, which presumably will make the lens elastic and less rigid. Also, with the average molecular weight of the polyhydroxy compound and the NCO content as disclosed in Carr, the viscosity of the prepolymer would increase and the flowability would lower, which would make it difficult to form polarized lenses by casting.

Thus, since Carr fails to teach all the material elements of the claims, this rejection also cannot be sustained and should be withdrawn.

With regard to the rejection of claims 5, 6, 8, 9 and 10-13 under 35 USC § 103(a) as being unpatentable over Carr in view of Slagel, this rejection is deemed to be untenable for the same reasons as noted above and is thus respectfully traversed.

To establish a *prima facie* case of obviousness under U.S. practice, the cited references in combination must teach or suggest the invention as a whole, including all the limitations of the claims. Here, in this case, the combination of Carr and Slagel fails to teach or suggest, the

polyurethane resin composition according to claim 1, having the advantages of low viscosity and long pot life as discussed above. Hence, the combination cannot suggest the superior polarized impact-resistant optical lens of claims 5 and 6. Thus, it is respectfully submitted that this rejection should be withdrawn.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

In view of the foregoing amendments and remarks, it is respectfully submitted that the Application is now in condition for allowance. Such action is thus respectfully solicited.

If, however, the Examiner has any suggestions for expediting allowance of the application or believes that direct communication with Applicants' attorney will advance the prosecution of this case, the Examiner is invited to contact the undersigned at the telephone number below.

Respectfully submitted,

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January 15, 2003



VERSION WITH MARKINGS TO SHOW CHANGES MADE

5. (Twice Amended) An impact-resistant polarized optical lens, [formed by casting] comprising the polyurethane resin composition [for casting] as claimed in claim 1.

6. (Amended) [An] The impact-resistant polarized optical lens as claimed in claim 5, which [wherein it] is a transparent lens, sunglass lens or polarized lens.

7. (Amended) A method of casting a polyurethane resin comprising [the steps of] reacting a polyisocyanate with a polyhydroxy compound to obtain a polyurethane prepolymer [so that] wherein the reaction molar ratio of said polyisocyanate to said polyhydroxy compound (NCO/OH) [will be] is 2.5 to 4.0, and the NCO content of the polyurethane prepolymer is 7.0 to 14.0%.

mixing [curing] the polyurethane prepolymer [obtained having an NCO content of 7.0 to 14.0%] with an aromatic polyamine [so that] to obtain said polyurethane resin, wherein the reaction molar ratio of said polyurethane prepolymer to said aromatic polyamine (NCO/NH₂) [will be] is 1.10 to 0.90, and

casting and curing said polyurethane resin at 60-120°C.

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Polyurethane Resin Composition and
Optical Lens Having Impact Resistance

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BACKGROUND OF THE INVENTION

TC 1700

5 I. Field of the Invention

[0001] This invention relates to a polyurethane resin composition for casting, which is a cast molding material for e.g. optical lenses, an impact-resistant optical lens molded from this material, and a method of casting a

10 polyurethane resin.

2. Description of the Related Art

[0002] Generally, plastic lenses are lightweight, difficult to break and easy to dye compared with inorganic glass lenses. Thus, in recent years, they are spreading quickly as spectacle lenses, camera lenses, etc.

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[0003] As resins widely used for plastic lenses, there are diethylene glycol bis(allyl carbonate) resin (CR-39) and thermoplastic resins such as polymethyl methacrylate resins, polystyrene resins and polycarbonate resins.

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[0004] But inorganic glass lenses and plastic lenses other than polycarbonate resins have a fault that impact resistance is insufficient, so that they tend to crack.

[0005] On the other hand, polycarbonate resin lenses are insufficient in the optical properties, though difficult to crack, and in particular, strain tends to occur and resistance to solvents and chemicals are insufficient.

Version with Markings to
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What is claimed is:

1. (AMENDED)

A polyurethane resin composition comprising a polyisocyanate, a polyhydroxy compound and an aromatic polyamine, ^{for forming a polarized lens,}
wherein said polyisocyanate is 4,4'-methylene-
bis(cyclohexyl isocyanate) or isophorone diisocyanate, ⁵

2.

A polyurethane resin composition as claimed in
⁽²⁾
claim 1, wherein said polyhydroxy compound is a polyether diol or a polyester diol having an average molecular weight of 700-1200, or ² ^{thereof} their mixture, ⁵

3.

A polyurethane resin composition as claimed in
⁽³⁾
claim 1, wherein said aromatic polyamine is 4,4'-methylene-
bis(2-chloroaniline), and ⁵

4.

A polyurethane resin composition as claimed in
⁽⁴⁾
claim 1, wherein said polyisocyanate and said polyhydroxy compound are reacted ^{to form a polyurethane prepolymer,} so that the reaction molar ratio of said polyisocyanate to said polyhydroxy compound (NCO/OH) is 2.5 to 4.0 and the NCO content of ^{the} polyurethane prepolymer obtained is 7.0 to 14.0%.

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